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The benthic marine flora of the Brač Island area (Middle Adriatic, Croatia)

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*A check list of marine benthic flora of the Brač Island area was compiled on the basis of long-term personal collections and the sparse bibliographical data. The list included a total of 308 taxa (species, subspecies, varieties, forms and stages) of benthic algae (Rhodophyta 191 taxa or 62%, Phaeophyta 69 taxa or 21.9%, Chlorophyta 46 taxa or 14.9%) and 2 species of segrasses (*Posidonia oceanica *and* Cymodocea nodosa*). The R/P ratio of 2.8 indicates a temperately tropical flora. The benthic flora is analyzed in terms of its phytogeographical components.*

Key words: benthic flora, marine algae and segrasses, check list, Brač Island, Middle Adriatic

INTRODUCTION

Benthic marine flora of algae and seagrasses of the Brač Island has not been well known until recently due to the fact that it has received very little attention in the past. The quantitative and qualitative investigations were carried out on the most frequent shallow water (4-5m depth) *Cystoseira* settlements during the period between 1963 and 1968. These investigations were made on the mainland 1300 long and the island coast of the eastern Adriatic part. As a part of these investigations the entire coast (165 km) of the Brač Island (ŠPAN, 1964, 1969) was included. As to the qualitative composition of benthic flora of the Brač Island, the data are only limited to the distribution and sites of records of some taxa of *Cystoseira* genus (ERCEGOVIĆ, 1952). During the past decade the area of Brač Island has been the site of more complex and systematic investigations with the respect to the composition and distribution of benthic flora in its different parts (ŠPAN and ANTOLIĆ, 1990a, 1990b), or of the most important settlements of benthic algae (ŠPAN and ANTOLIĆ, *in press*) and marine phanerogams (ANTOLIĆ, 1994; ANTOLIĆ and ŠPAN, 1997). A preliminary inventory of benthic algae and segrasses of the Brač Island was compiled on the basis of these data. The inventory is enclosed to the present paper.

THE STUDY AREA, MATERIAL AND METHODS

The Brač Island belongs to the Mid-Dalmatian Island group. Its northern coast is close to the mainland coast, thus it is under its strong influence. The island is approximately 42 km long and about 13.5 km wide. The coastline is approximately 165 km long and well indented in some parts. This particularly applies to its south-western and western parts as well as north-eastern and south-eastern parts. The Brač Channel is situated on the northern side of the island, while the southern side of Brač Island is bordered by the Hvar Channel (Fig. 1).

While its southern coast is to a certain extent sheltered from the sea hydrodynamism by the Hvar Island, its south-eastern part is strongly exposed to the wind from the south-east, while its northernmost part is strongly affected by waves generated by bora wind.

The rocky southern coast of the island is rather steep, sometimes descending with a great inclination into the sea, where suddenly reaches relatively great depths. The northern coast is less steep, descending into the sea with a smaller inclination. Due to these facts, the northern coast is much more suitable for a development of the shallow water of *Cystoseira* settlements. Sediment bottoms of different textures (gravely, gravely-sandy, sandy and sandy-muddy) are deeper than rocky bottoms of the island. Abundant meadows of seagrasses, *Cymodocea nodosa* and *Posidonia oceanica,* are developed on these sediment bottoms.

The studies were carried out on the western (from the Cape Gomilica to the Cape Zaglav) and the southern (from the Cove Blaca to the Cove Konjska) coast of the island. Samplings of plant material were also performed at a larger number of stations out of this area.

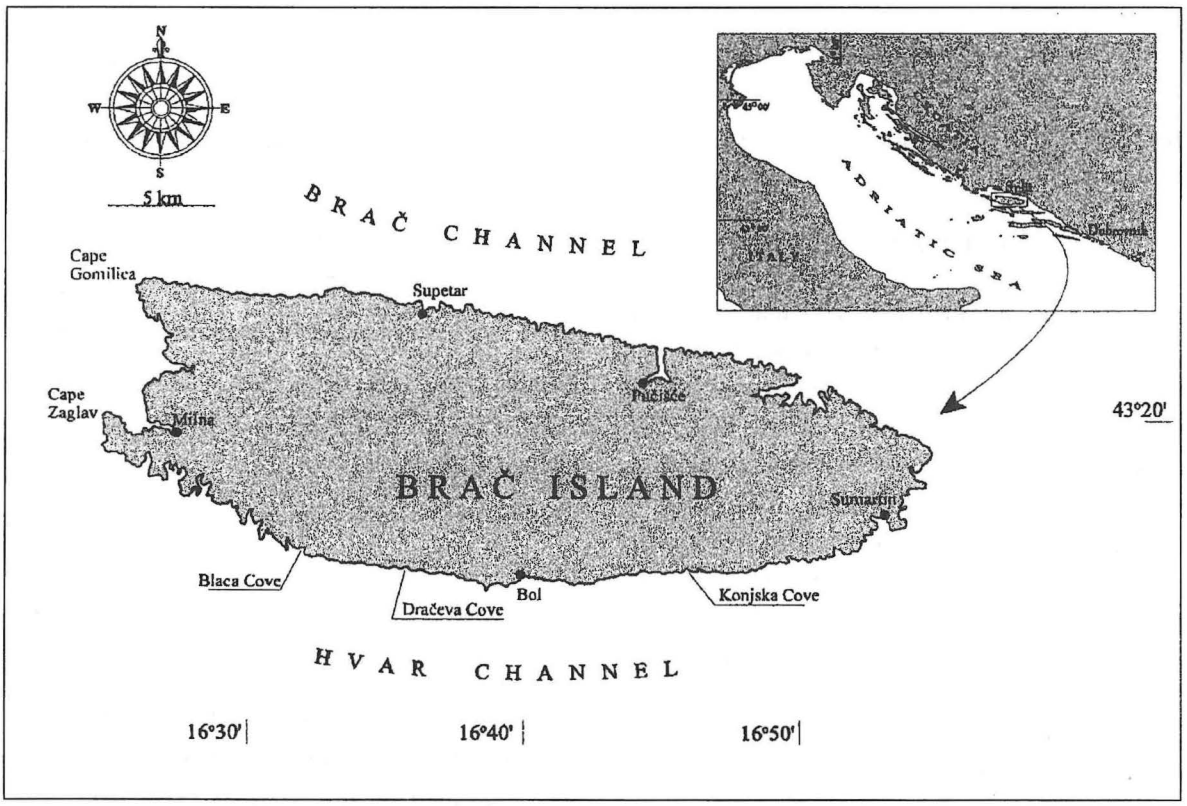

Fig. 1. Map of the study area of the Brač Island

Collection of phytobenthic material was carried out by SCUBA divers along the deep transects down to 20 (30) m depths. At a depth of approximately 50 m material was collected by a triangular dredge. This way of sampling was applied in supralittoral, eulittoral (mediolittoral), upper (from 0 to 6/7 m depths), medium (from 6/7 to 30/35 m depth) and lower infralittoral (from 30/35 m to 100/120 m depth) (ERCEGOVIĆ, 1964, 1980).

Benthic flora of the study area was analyzed by numbers and percentages of main systematic divisions Rhodophyta, Phaeophyta and Chlorophyta.

For categorization and identification of higher taxonomic categories (classes, orders and families) the classifications by BOUDOURESQUE *et al.* (1984), BOUDOURESQUE and PERRET-BOUDOURESQUE (1987), PERRET-BOUDOURESQUE and SERIDI (1989), RIBERA *et al.* (1992), GALLARDO *et al.* (1993) and SILVA *at al.* (1996) were used.

Phytogeographic distribution was established by slightly simplified groups of floral elements outlined by GIACCONE *et al.* (1985): M - Mediterranean, A - Atlantic, which includes Ab - Atlantic boreal, At - Atlantic tropical and Abt - Atlantic boreal-tropical, AP - Atlanto-Pacific, which includes Apo - Atlanto-Pacific-holo, Apt - Atlanto-Pacific tropical and Aptc - Atlanto -Pacific tropical-cold, IA-Indo-Atlantic, which includes IAo -Indo-Atlantic holo, IAt - Indo Atlantic tropical and IATC - Indo-Atlantic tropical-cold, C- cosmopolitan, SC - subcosmopolitan, IP - Indo-Pacific, CB-circumboreal, CT-circumtropical and EAD - Adriatic endemic (Table 1).

RESULTS AND DISCUSSION

Qualitative composition of benthic flora

Out of the floral material collected from the sea around the Brač Island 308 taxa (species, subspecies, varieties, forms and stages) of benthic algae and seagrasses have been determined, so far. They belong to 4 systematic divisions (Rhodophyta, Phaeophyta, Chlorophyta and Angiospermae), 5 classes, 30 orders, 67 families and 159 genera (Table 1).

Table 1. Number (N) and percentage (%) presence of main systematic divisions (Rh - Rhodophyta, Ph - Phaeophyta, Ch - Chlorophyta, Ang - Angiospermae) and phytogeographic elements (Phyt. el.) in benthic flora of the Brač Island area

Division	Rhodophyta		Phaeophyta		Chlorophyta		Angiospermae		Total	
Phyt. el.	N	%	N	%	N	%	N	%	N	%
M	43	14.0	20	6.5	5	1.6	1	0.3	69	22.4
A	78	25.3	13	4.2	19	6.2	1	0.3	111	36.0
AP	10	3.2	7	2.3	6	1.9	-	-	23	7.5
IA	12	3.9	3	1.0	4	1.3	-	-	19	6.2
IP	1	0.3	-	-	1	0.3	-	-	2	0.6
C	15	4.9	8	2.6	5	1.6	-	-	28	9.1
SC	24	7.8	8	2.6	-	-	-	-	32	10.4
CT	7	2.3	3	1.0	4	1.3	-	-	14	4.5
CB	-	-	2	0.6	1	0.3	-	-	3	1.0
EAD	1	0.3	5	1.6	1	0.3	-	-	7	1.9
Total	191	62.0	69	21.9	46	14.9	2	0.6	308	100.0

The Rhodophyta, with 191 taxa made up to 62.0% of the total number of determined taxa. The Phaeophyta were present, with 69 taxa or 22.4%, and even more moderately present were Chlorophyta, not exceeding 46 taxa or 14.9%. Two species of seagrasses were also determined (Angiospermae; *Posidonia oceanica* and *Cymodocea nodosa*), which constituted 0.6% of the total benthic flora studied in the sea around the Brač Island (Tables 1 and Table 3 in Annex).

A comparison of the benthic flora of Brač Island with the flora of Hvar Island (ŠPAN, 1980a) and the islands of Vis and Biševo (ŠPAN, 1980b) in the open sea of the middle Adriatic, showed that the flora of Brač Island is poorer in the total number of algal taxa than the flora of Hvar Island and the islands of Vis and Biševo. To be noted that while the number of Rhodophyta and Phaeophyta is increasing from the Brač Island (191 and 69 algal taxa) to the islands of Vis and Biševo (237 and 107 algal taxa); the greater number of Chlorophyta exist in the Hvar Island benthic flora (63 algal taxa) while the lowest is determined in the Brač Island benthic flora (46 algal taxa)(Table 2).

The comparison based on per cent values shows decreasing values of Rhodophyta from the Brač Island (62.0 %) to the islands of Vis and Biševo (58.8 %); increasing values of Phaeophyta from the Brač Island (21.9 %) to the islands of Vis and Biševo; decreasing values from the Brač Island (14.9 %) to the islands of Vis and Biševo (14.6 %) with the highest value in the Hvar Island (17.7 %)(Table 2).

The ratio between the number of taxa in Rhodophyta to Phaeophyta (R/P quotient; FELDMANN, 1938) was 2.8, pointing to a temperately tropical character of studied benthic flora. The same value of quotient R/P was determined for the benthic flora of the Hvar Island. On the contrary, low ratio values (2.2) obtained for the islands of Vis and Biševo, suggest almost boreal character (Table 2).

Structure of benthic flora

The analysis of floral composition and structure of benthic flora shows that each of three basic systematic divisions of benthic algae (Rhodophyta, Phaeophyta and Chlorophyta) comprised a small number of classes, orders, families and genera characterized by a large number of taxa while, on the contrary, there was a large number of genera and families characterized by a small number of taxa.

The class Florideophyceae comprised 182 taxa divided in 11 orders, 27 families and 93 genera, while the class Bangiophyceae included only 9 taxa divided in 3 orders, 3 families and 5 genera. The order Ceramiales was characterized by the largest number of 88 taxa (88) with 4 families (Ceramiceae: 48 taxa, Rhodomelaceae: 26 taxa, Delesseriaceae: 8 taxa, Dasyaceae: 6 taxa), which makes up 46% of the total of the Rhodophyta. The order Corallinales with a sin-

Table 2. Numbers (N) and percentages (%) of Rhodophyta, Phaeophyta and Chlorophyta members and R/P ratios calculated for floras of Brač Island, Hvar Island and islands of Vis and Biševo

Area	Brač		Hvar		Vis - Biševo	
Division	N	%	N	%	N	%
Rhodophyta	191	62.0	216	60.5	237	58.8
Phaeophyta	69	21.9	78	21.8	107	28.6
Chlorophyta	46	14.9	63	17.6	59	14.6
TOTAL	**306**		**357**		**403**	
R/P	**28**		**2.8**		**2.2**	

gle family Corallinaceae included 27 taxa, whereas the order Cryptonemiales, with 6 families, comprised 16 taxa of benthic algae. In addition, it should be pointed out that 62 genera have a single taxa, 48 genera 2 taxa, 7 genera 3 taxa, 6 genera 4 taxa and only 3 genera 9, 12 and 14 taxa of benthic algae, respectively. These data show that, out of 98 genera in Rhodophyta, only 3 comprised more than 4 taxa (Table 2, Fig. 2).

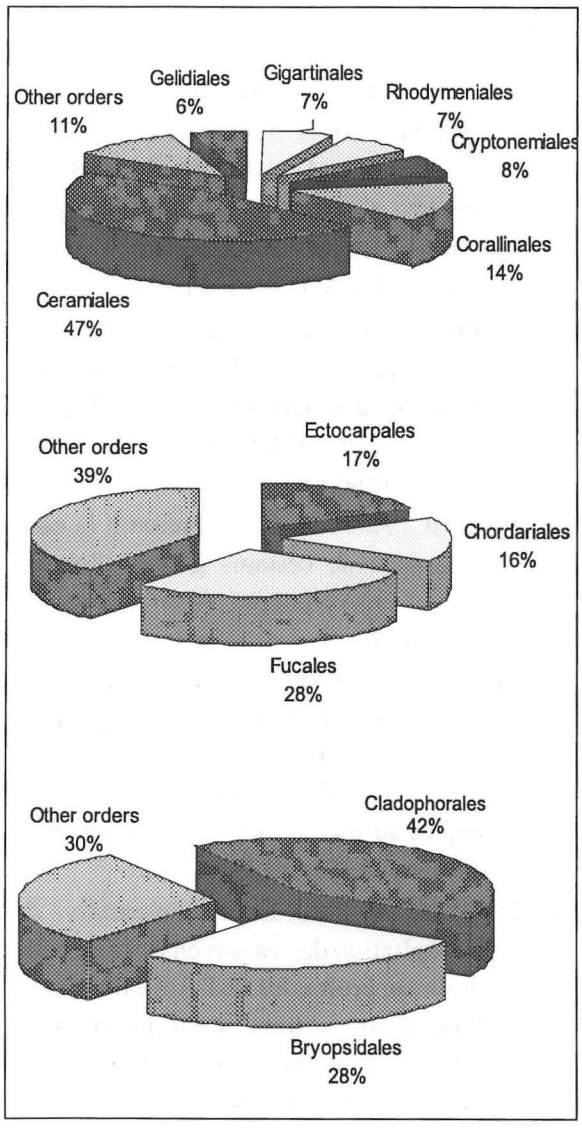

Fig. 2. Percentage (%) presence of the main systematic orders in the structure of benthic marine flora of the Brač Island area

In the Phaeophyta, which counts 9 orders, 22 families and 36 genera, the order Fucales was most numerous with 3 families (Cystoseiraceae: 13 taxa, Sargassaceae: 5 taxa, Fucaceae: 1 taxa), followed by Ectocarpales with 2 families (Ectocarpaceae: 10 taxa, Ralfsiaceae: 2 taxa) and Chordariales with 5 families (Chordariaceae: 1 species, Elachistaceae: 2 taxa, Myrionemataceae: 2 taxa, Stypocaulaceae: 2 taxa, Corynophleaceae: 4 taxa), which constituted 61% of determined taxa in this division. Contrary to the earlier mentioned orders, there are some orders with a small number of benthic taxa. These are: the order Sporochnales with the family Sporochnaceae and a single taxa, the order Scytosiphonales with the family Scytosiphonaceae and 2 taxa and the order Cutleriales with the family Cutleriaceae and 3 taxa (Table 2, Fig. 2).

In the Chlorophyta, which included 6 orders, 14 families and 25 genera, the orders Chladophorales with 4 families (Cladophoraceae: 13 taxa, Siphonocladaceae: 3 taxa, Chaetosiphonaceae: 2 taxa, Anadyomenaceae: 1 species) and Bryopsidales with 4 families (Udoteaceae: 4 taxa, Bryopsidaceae: 3 taxa, Codiceae: 3 taxa, Derbesiaceae: 3 taxa) occur with a pronounced number of taxa. These two orders make up 67% of all determined taxa in this division. On the contrary to these two orders the orders Volvocales and Ulotrichales are characterized by a small number of species belonging to a single family respectively (Tetrasporaceae: 1 species, Ulotrichaceae: 2 taxa) and the order Dasycladales with 2 families (Dasycladaceae and Polyphisaceae with a single species each) (Table 2, Fig. 2).

Phytogeographic composition of benthic flora

Benthic flora of algae and seagrasses in the Brač Island area is not unique. It comprises floral elements originating from the different phytogeographic regions and provinces (Tables

1 and 2). The Atlantic (111 taxa or 36.0%) and Mediterranean (69 taxa or 22.4%) floral elements are dominant by their numbers and percentages including 180 taxa, or 58.4% of all determined taxa of benthic algae and marine phanerogams (308) in the study area, so far. Of other floral elements, the subcosmopolitan elements, with 32 taxa or 10.4% and the cosmopolitan ones, with 28 taxa or 9.1%, making up together 60 taxa or 19.5% of the total numbers, were well represented. Atlanto-Pacific floral elements included 23 taxa or 7.5% and Indo-Atlantic 19 taxa or 16.2% of the total numbers of taxa of the Brač Island. Indo-Pacific elements with 2 taxa or 0.6% and circumboreal floral elements with 3 taxa or 1.0% of the total number of taxa were least represented. The Adriatic endemic species were represented by 7 taxa or 2.3% of the total numbers of determined taxa of benthic algae and marine phanerogams in the area of the Brač Island.

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Morska bentoska flora otoka Brača (srednji Jadran, Hrvatska)

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SAŽETAK

Flora je bentoskih algi i morskih cvjetnica otoka Brača do danas gotovo nepoznata jer su istraživanja bila malobrojna. Na temelju istraživanja provedenih tijekom zadnjih 20 godina, te nekih starijih bibliografskih podataka, sastavljena je inventarna lista bentoskih alga i morskih cvjetnica otoka Brača, koju i prilažemo u radu.

Prikupljanje je fitobentoskog materijala obavljeno s pomoću samostalnih ronilaca i trokutaste dredže uzduž dubinskih transekata koji su obuhvaćali bionomske stepenice supralitoral, eulitoral (mediolitoral), gornji (od 0 m do 6/7 m dubine), srednji (od 6/7 m do 30/35 m dubine) i donji infralitoral (od 30/35 m do 100/120 m dubine)(ERCEGOVIĆ, 1964, 1980). Istraživanjima su obuhvaćena površinska stjenovita dna s bujno razvijenim naseljima alga iz roda *Cystoseira*, te dublja sedimentna dna različite teksture (šljunkovito, šljunkovito-pjeskovito, pjeskovito i pjeskovito-muljevito) na kojima su razvijene livade morskih cvjetnica *Cymodocea nodosa* i *Posidonia oceanica*.

Bentoska je flora istraživanoga područja analizirana s pomoću brojčanih i postotnih odnosa glavnih sistematskih odjeljaka Rhodophyta, Phaeophyta i Chlorophyta. Fitogeografska je pripadnost prikazana s pomoću nešto pojednostavljenih skupina flornih elemenata prema autorima GIACCONE et al. (1985).

Ukupno je do sada određeno 308 svojti (vrsta, podvrsta, odlika, oblika i stadija) bentoskih alga i morskih cvjetnica koje su svrstane u 4 sistematska odjeljka (Rhodophyta, Phaeophyta, Chlorophyta i Angiospermae), 5 razreda, 30 redova, 67 porodica i 159 rodova.

Najbrojnije su zastupljene svojte iz odjeljka Rhodophyta (191 svojta ili 62,0%), a slijede ih svojte iz odjeljaka Phaeophyta (69 svojti ili 22,4%) i Chlorophyta (46 svojte ili 14,9%). Određene su i 2 vrste morskih cvjetnica (odjeljak Angiospermae; *Posidonia oceanica* i *Cymodocea nodosa*) koje čine 0,6% zastupljenosti u istraživanoj bentoskoj flori u podmorju otoka Brača .

U odjeljku Rhodophyta, koji obuhvaća 14 redova, 32 porodice i 98 rodova, brojem se svojti ističu redovi Ceramiales (4 porodice i 88 svojti), Corallinales (1 porodica i 27 svojti) i Cryptonemiales (6 porodica i 16 svojti) koji ukupno obuhvaćaju 69% svojti u tom odjeljku. U odjeljku Phaeophyta, koji obuhvaća 9 redova, 22 porodice i 36 roda brojem se ističu redovi Fucales, Ectocarpales i Chordariales koji ukupno obuhvaćaju 42 svojte bentoskih algi ili 60,9% ukupno određenih svojti u tom odjeljku. U odjeljku Chlorophyta, koji obuhvaća 6 redova, 14 porodica i 25 rodova, po broju se svojti ističu redovi Chladophorales i Bryopsidales koji zajedno obuhvaćaju 69,6% svih određenih svojti u tom odjeljku.

Odnos broja svojti u odjeljcima Rhodophyta i Phaeophyta (kvocijent R/P; FELDMANN, 1938) iznosi 2,76 što ukazuje na umjereno tropski značaj istražene bentoske flore.

Od flornih elemenata brojem i postotkom prevladavaju atlantski (112 svojti ili 36,4%) i sredozemni (69 svojti ili 22,4%) florni elementi, koji ukupno obuhvaćaju 181 svojtu ili 58,8% svih dosad određenih svojti bentoskih alga i morskih cvjetnica (308) u podmorju otoka Brača. Od ostalih su flornih elemenata još dobro zastupljeni subkozmopolitski s 32 svojte ili 10,4%, te kozmopolitski s 28 svojti ili 9,1%, što zajedno čini 60 svojti ili 19,5% od ukupnoga broja svojti na otoku Braču.

ANNEX

Table 3. Check list of benthic marine algae and segrasses in the Brač Island area with signs of their phytogeographic elements

TAXA	Phyt. elem.
Division: RHODOPHYTA	
Class: BANGIOPHYCEAE	
Order: Porphyridiales	
Family: Goniotrichaceae	
Chroodactylon ornatum (C.AGARDH) BASSON	C
Stylonema alsidii (ZANARDINI) DREW	C
S.cornu-cervi REINSCH	Apo
Order: Erythropeltidiales	
Family: Erythropeltidaceae	
Erythrocladia subintegra ROSENVINGE	C
Erythrotrichia carnea (DILLWYN) J.AGARDH	C
E. investiens (ZANARDINI) BORNET	Ab
E. reflexa (CROUAN *et* CROUAN) THURET	Ab
Order: Bangiales	
Family: Bangiaceae	
Bangia atropurpurea (ROTH) C.AGARDH	C
Porphyra leucosticta THURET *in* LE JOLIS	SC
Class: FLORIDEOPHYCEAE	
Order: Acrochaetiales	
Family: Acrochaetiaceae	
Acrochaetium daviesii (DILLWYN) NÄGELI	APo
A. humile (ROSENVINGE) BÖRGESEN	Ab
A. mahumetanum HAMEL	Ab
A. virgatulum (HARVEY) BORNET	Ab
Rhodochorton hauckii (SCHIFFNER) HAMEL	M
Order: Nemaliales	
Family: Helminthocladiaceae	
Liagora viscida (FORSSKAAL) C.AGARDH	IAo
Nemalion helminthoides (VELLEY) BATTERS	SC
Order: Gelidiales	
Family: Gelidiaceae	
Gelidiella lubrica (KÜTZING) J.FELDMANN *et* HAMEL	M
G. pannosa (J.FELDMANN) J.FELDMANN *et* HAMEL	SC
Gelidium crinale (TURNER) GAILLON	Apo
G. latifolium (GREVILLE) THURET *et* BORNET	

Table 3. cont'd

TAXA	Phyt. elem.
var. *latifolium*	SC
var. *hystrix* (J.AGARDH) HAUCK	M
var. *luxurians* CROUAN *et* CROUAN	M
G. melanoideum SCHOUSBOE *ex* BORNET	
var. *melanoideum*	M
var. *filamentosum* SCHOUSBOE *ex* BORNET	Abt
G. minusculum (WEBER-van BOSSE) NORRIS	C
G. pectinatum (SCHOUSBOE) MONTAGNE	Ab
G. spathulatum (KÜTZING) BORNET	Ab
Wurdemannia miniata (LAMOUROUX) FELDMANN *et* HAMEL	CT
Order: Gigartinales	
Family: Gigartinaceae	
Chondracanthus acicularis (ROTH) FREDERICQ	C
Family: Hypneaceae	
Hypnea musciformis (WULFEN) LAMOUROUX	CT
Family: Plocamiaceae	
Plocamium cartilagineum (LINNAEUS) DIXON	SC
Family: Nemastomaceae	
Nemastoma dichotoma J.AGARDH	M
Platoma cyclocolpa (MONTAGNE) SCHMITZ	Ab
Family: Sebdeniaceae	
Sebdenia dichotoma BERTHOLD	M
Family: Phyllophoraceae	
Phyllophora nervosa (DE CANDOLLE) GREVILLE	Ab
Schottera nicaeînsis (LAMOUROUX *ex* DUBY) GUIRY *et* HOLLENBERG	Ab
Family: Caulacanthaceae	
Catenella caespitosa (WITHERING) L.IRVINE	SC
Caulacanthus ustulatus (TURNER) KÜTZING	SC
Family: Rhodophyllidaceae	
Rhodophyllis divaricata (STACKHOUSE) PAPENFUSS	Ab
Family: Sphaerococcaceae	
Sphaerococcus coronopifolius STACKHOUSE	Ab
Family: Sarcodiaceae	
Chondrymenia lobata (MENEGHINI) ZANARDINI	Ab
Order: Gracilariales	
Family: Gracilariaceae	
Gracilaria bursa-pastoris (GMELIN) SILVA	SC
G. dura (C.AGARDH) J.AGARDH	IAo
Order: Rhodymeniales	
Family: Champiaceae	

Table 3. cont'd

TAXA	Phyt. elem.
Champia parvula (C.AGARDH) HARVEY	C
Chylocladia verticillata (LIGHTFOOT) BLIDING	IAtc
Gastroclonium clavatum (ROTH) ARDISSONE	M
G. reflexum (CHAUVIN) KÜTZING	M
Lomentaria articulata (HUDSON) LYNGBYE	Ab
L. chylocladiella FUNK	M
L. verticillata FUNK	M
Family: Rhodymeniaceae	
Botryocladia botryoides (WULFEN *in* JACQUIN) J.FELDMANN	Abt
B. chiajeana (MENEGHINI) KYLIN	Abt
B. microphysa (HAUCK) KYLIN	M
Chrysimenia ventricosa (LAMOUROUX) J.AGARDH	At
Fauchea repens (C.AGARDH) MONTAGNE *et* BORY	Ab
Rhodymenia ardissonei J.FELDMANN	M
var. *ardissonei*	
var. *torta* (ERCEGOVIĆ) ŠPAN *et* ANTOLIĆ *combinatio nova*	EAD
Order: C r y p t o n e m i a l e s	
Family: Acrosymphytaceae	
Acrosymphyton purpuriferum (J.AGARDH) SJÖSTEDT	M
Family: Dumontiaceae	
Dudresnaya verticillata (VELLEY) LE JOLIS	Ab
Family: Cryptonemiaceae	
Acrodiscus vidovichii (MENEGHINI) ZANARDINI	M
Aeodes marginata (RUSSEL) SCHMITZ	M
Cryptonemia lomation (BERTOLONI) J.AGARDH	M
C. tunaeformis (BERTOLONI) ZANARDINI	M
Halymenia floresia (CLEMENTE) C.AGARDH	SC
Family: Kallymeniaceae	
K. spathulata (J.AGARDH) CODOMIER	M
Meredithia microphylla (J.AGARDH) J.AGARDH	Ab
Family: Peyssonneliaceae	
Peyssonnelia armorica (CROUAN *et* CROUAN) BÖRGESEN	Ab
P. harveyana CROUAN *et* CROUAN *ex* J.AGARDH	Ab
P. polymorpha (ZANARDINI) SCHMITZ	SC
P. rubra (GREVILLE) J.AGARDH	Ab
P. squamaria (GMELIN) DECAISNE	M
Family: Rhyzopphyllidaceae	
Contarinia peyssonneliaeformis ZANARDINI	M
C. squamariae (MENEGHINI) DENIZOT	M
Order: C o r a l l i n a l e s	
Family: Corallinaceae	
Amphiroa beauvoisii LAMOUROUX	IAtc
A. cryptarthrodia ZANARDINI	APt
A. rigida LAMOUROUX	SC
Corallina elongata ELLIS *et* SOLANDER	Ab
C. officinalis LINNAEUS	APo

Table 3. cont'd

TAXA	Phyt. elem.
Fosliella farinosa (LAMOUROUX) HOWE	
f. callithamnioides (FOSLIE) CHAMBERLAIN	C
F. minutula (FOSLIE) GANESAN	Abt
Haliptilon virgatum (ZANARDINI) GARABRY *et* JOHANSEN	IAtc
Hydrolithon cruciatum (BRESSAN) CHAMBERLAIN	SC
H. farinosum (LAMOUROUX) PENROSE *et* CHAMBERLAIN	C
Jania longifurca ZANARDINI	Ab
J. rubens (LINNAEUS) LAMOUROUX	C
Lithophyllum incrustans PHILIPPI	Ab
L. racemus (LAMARCK) FOSLIE	M
L. lichenoides PHILIPPI	At
Lithothamnion coralloides CROUAN *et* CROUAN	Ab
Melobesia membranacea (ESPER) LAMOUROUX	IAo
Phymatolithon calcareum (PALLAS) ADEY *et* Mc KIBBIN	Ab
P. lenormandii (ARESCHOUG) ADEY	Ab
Pneophyllum fragile KÜTZING	C
Pseudolithophyllum expansum (PHILIPPI) LEMOINE	At
Spongites fruticulosus KÜTZING	Ab
S. notarisii (DUFOUR) ATHANASIADIS	Ab
Titanoderma cystoseirae (HAUCK) WOELKERLING *et al.*	Ab
T. pustulatum (LAMOUROUX) NÄGELI	
var. *pustulatum*	C
var. *confine* (CROUAN *et* CROUAN) CHAMBERLAIN	Ab
f. simile (FOSLIE) BOUDOURESQUE *et* PERRET-BOUDOURESQUE	M
Order: H i l d e n b r a n d i l a e s	
Family: Hildenbrandiaceae	
Hildenbrandia rubra (SOMERFELD) MENEGHINI	APo
Order: B o n n e m a i s o n i a l e s	
Family: Bonnemaisoniaceae	
Falkenbergia rufolanosa (HARVEY) SCHMITZ - stage	Abt
Hymenoclonium serpens (CROUAN *et* CROUAN) BATTERS - stage	Abt
Order: C e r a m i a l e s	
Family: Ceramiaceae	
Aglaothamnion byssoides (ARBOTT) BOUDOURESQUE *et* PERRET-BOUDOURESQUE	Ab
A. caudatum (J.AGARDH) G.FELDMANN	M
A. tenuissimum (BONNEMAISON) FELDMANN-MAZOYER	M
A. tripinnatum (GRATELOUP) FELDMANN-MAZOYER	Ab
Antithamnion cruciatum (C.AGARDH) NÄGELI	
var. *cruciatum*	Abt
var. *profundum* FELDMANN-MAZOYER	Abt
A. heterocladum FUNK	M
A. tenuissimum (HAUCK) SCHIFFNER	Ab
Callithamnion corymbosum (SMITH) LYNGBYE	Abt
C. granulatum (DUCLUZEAU) C.AGARDH	Ab
Ceramium bertholdi FUNK	M
C. ciliatum (ELLIS) DUCLOUZEAU	Ab
C. circinatum (KÜTZING) J.AGARDH	Abt
C. codii (RICHARDS) MAZOYER	IAo
C. comptum BÖRGESEN	Abt
C. diaphanum (LIGHTFFOOT) ROTH	

Table 3. cont'd

TAXA	Phyt. elem.
var. *diaphanum*	SC
var. *lophophorum* FELDMANN-MAZOYER	At
C. deslongchampii CHAUVIN *ex* DUBY	Ab
C. echionotum J.AGARDH	Ab
C. flaccidum (HARVEY *ex* KÜTZING) ARDISSONE	C
C. ordinatum KÜTZING	M
C. rubrum (HUDSON) C. AGARDH	
var. *barbatum* (KÜTZING) J.AGARDH	Ab
C. tenerrimum (MARTENS) OKAMURA	SC
C. nodosum (KÜTZING) HARVEY	SC
Compsothamnion thuyoides (SMITH) SCHMITZ	Abt
Crouania attenuata (BONNEMAISON) J.AGARDH	SC
Griffithsia barbata (SMITH) C.AGARDH	Abt
G. phyllamphora J.AGARDH	M
G. schousboei MONTAGNE	Abt
Gulsonia nodulosa (ERCEGOVIĆ) J.FELDMANN *et* G.FELDMANN	M
Gymnothamnion elegans (SCHOUSBOE *ex* C.AGARDH) J.AGARDH	APo
Lejolisia mediterranea BORNET	CT
Monosporus pedicellatus (SMITH) SOLIER *in* CASTAGNE	
var. *pedicellatus*	APo
var. *tenuis* G.FELDMANN	M
Pleonosporium borreri (SMITH) NÄGELI	Abt
Pterothamnion crispum (DUCLUZEAU) NÄGELI	SC
Pterothamnion plumula (ELLIS) NÄGELI	SC
Ptilothamnion pluma (DILLWYN) THURET	Ab
Seirospora apiculata (MENEGHINI) FELDMANN-MAZOYER	M
S. interrupta (SMITH) SCHMITZ	Ab
S. sphaerospora J.FELDMANN	M
Spermothamnion flabellatum BORNET	M
S. johannis G.FELDMANN-MAZOYER	M
S. repens (DILLWYN) ROSENVINGE	
var. *repens*	Ab
var. *flagelliferum* (DE NOTARIS) FELDMANN-MAZOYER	Ab
Sphondylothamnion multifidum (HUDSON) NÄGELI	Ab
Spyridia filamentosa (WULFEN) HARVEY	C
Wrangelia penicillata (C.AGARDH) C.AGARDH	APt
Family: Dasyaceae	
Dasya baillouviana (GMELIN) MONTAGNE	IAo
D. hutchinsiae (HARVEY) HOOKER	Ab
D. ocellata (GRATELOUP) HARVEY	Abt
Eupogodon planus (C.AGARDH) KÜTZING	Ab
E. spinellus (C.AGARDH) KÜTZING	Ab
Heterosiphonia crispella (C.AGARDH) WYNNE	SC
Family: Delesseriaceae	
Acrosorium venulosum (ZANARDINI) KYLIN	M
Apoglossum ruscifolium (TURNER) J.AGARDH	Abt
Arachnophyllum confervaceum (MENEGHINI) ZANARDINI	M
Erythroglossum sandrianum (ZANARDINI) KYLIN	Ab
Hypoglossum hypoglossoides (STACKHOUSE) COLLINS *et* HARVEY	Ab
Myriogramme tristromatica (RODRIGUEZ *ex* MAZA) BOUDOURESQUE	M
Nithophyllum punctatum (STACKHOUSE) GREVILLE	IAo
Radicilingua thysanorhizans (HOLMES) PAPENFUSS	Ab
Family: Rhodomelaceae	

Table 3. cont'd

TAXA	Phyt. elem.
Brogniartella byssoides (GOODENOUGH *et* WOODWARD) SCHMITZ	Ab
Chondria dasyphylla (WOODWARD) C.AGARDH	SC
C. tenuissima (GODENOUGH *et* WOODWARD) C.AGARDH	IAo
Dipterosiphonia rigens (SCHOUSBOE *ex* C.AGARDH) FALKENBERG	At
Erythrocystis montagnei (DERBES *et* SOLIER) P.C.SILVA	M
Halodictyon mirabile ZANARDINI	M
Herposiphonia secunda (C.AGARDH) AMBRONN	
f. secunda	CT
f. tenella (C.AGARDH) WYNNE	CT
Laurencia obtusa (HUDSON) LAMOUROUX	C
L. paniculata (C.AGARDH) J.AGARDH	SC
L. papillosa (C.AGARDH) GREVILLE	CT
L. pinnatifida (GMELIN) LAMOUROUX	SC
Lophosiphonia cristata FALKENBERG	CT
L. obscura (C.AGARDH) FALKENBERG	SC
Polysiphonia elongata (HUDSON) SPRENGEL	Abt
P. fruticulosa (WULFEN) SPRENGEL	Ab
P. opaca (C.AGARDH) MORRIS *et* DE NOTARIS	Ab
P. sanguinea (C.AGARDH) ZANARDINI	Ab
P. scopulorum HARVEY	IP
P. sertularioides (GRATELOUP) J.AGARDH	IAtc
P. subulifera (C.AGARDH) HARVEY	Ab
P. tenerrima KÜTZING	M
Pterosiphonia pennata (C.AGARDH) SAUVAGEAU	SC
Rodriguezella strafforellii SCHMITZ	M
Rytiphlaea tinctoria (CLEMENTE) C.AGARDH	At
Vidalia volubilis (LINNAEUS) J.AGARDH	At
Division: PHAEOPHYTA	
Class: FUCOPHYCEAE (PHAEOPHYCEAE)	
Order: E c t o c a r p a l e s	
Family: Ectocarpaceae	
Acinetospora crinita (CARMICHAEL *ex* HARVEY) SAUVAGEAU	M
E. siliculosus (DILLWYN) LYNGBYE	
var. *siliculosus*	C
var. *adriaticus* (ERCEGOVIĆ) CORMACI *et* FURNARI	M
F. caespitula (J.AGARDH) KNOEPFFLER-PÉGUY	
var. *caespitula*	IAtc
var. *lebelii* (ARESCHOUG *ex* CROUAN *et* CROUAN) KNOEPFFLER-PÉGUY	Ab
F. irregularis (KÜTZING) HAMEL	
var. *irregularis*	C
var. *lebeliides* (ERCEGOVIĆ) ŠPAN et ANTOLIĆ	EAD
Hincksia dalmatica (ERCEGOVIĆ) CORMACI *et* FURNARI	M
H. hauckii (ERCEGOVIĆ) CORMACI *et* FURNARI	M
H. sandriana (ZANARDINI) P.SILVA	SC
Family: Ralfsiaceae	
Pseudolithoderma adriaticum (HAUCK) VERLAQUE	Ab
Ralfsia verrucosa (ARESCHOUG) J.AGARDH	APtc
Order: C h o r d a r i a l e s	

Table 3. cont'd

TAXA	Phyt. elem.
Family: Elachistaceae	
Elachista intermedia CROUAN *et* CROUAN	
var. *intermedia*	Ab
f. profunda ERCEGOVIĆ	EAD
Family: Myrionemataceae	
Myrionema orbiculare J.AGARDH	APo
M. strangulans GREVILLE	APo
Family: Corynophlaeaceae	
Corynophloea umbellata (C.AGARDH) KÜTZING	Ab
Myriactula rigida (SAUVAGEAU) HAMEL	M
M. rivulariae (SUHR *in* ARESCHOUG) J.FELDMANN	Ab
M .stellulata (HARVEY) LEVRING	Ab
Family: Chordariaceae	
Cladosiphon mediterraneus KÜTZING	M
Family: Spermatochnaceae	
Spermatochnus paradoxus (ROTH) KÜTZING	SC
Stilophora tenella (ESPER) P.SILVA	SC
Order: S p o r o c h n a l e s	
Family: Sporochnaceae	
Nereia filiformis (J.AGARDH) ZANARDINI	At
Sporochnus pedunculatus (HUDSON) C.AGARDH	APo
Order: C u t l e r i a l e s	
Family: Cutleriaceae	
Aglaozonia chilosa FALKENBERG - stage	M
Cutleria multifida (SMITH) GREVILLE	SC
Zanardinia prototypus (NARDO) NARDO	APo
Order: S p h a c e l a r i a l e s	
Family: Cladostephaceae	
Cladostephus spongiosus (HUDSON) C.AGARDH	
f. verticillatus (LIGHTFOOT) PRUD'HOMME VAN REINE	CB
Family: Sphacelariaceae	
Sphacelaria cirrosa (ROTH) C.AGARDH	SC
S. fusca (HUDSON) S.F.GRAY	SC
S. plumula ZANARDINI	Ab
S. tribuloides MENEGHINI	C
Family: Stypocaulaceae	
Halopteris filicina (GRATELOUP) KÜTZING	APtc
H. scoparia (LINNAEUS) SAUVAGEAU	SC
Order: D i c t y o t a l e s	

Table 3. cont'd

TAXA	Phyt. elem.
Family: Dictyotaceae	
Dictyopteris polypodioides (DE CANDOLLE) LAMOUROUX	C
Dictyota dichotoma (HUDSON) LAMOUROUX	
var. *dichotoma*	C
var. *intricata* (C.AGARDH) GREVILLE	SC
D. fasciola (ROTH) LAMOUROUX	IAo
D. linearis (C.AGARDH) GREVILLE	CT
Padina pavonica (LINNAEUS) THIVY	CT
Taonia atomaria (WOODWARD) J.AGARDH	Abt
Order: D i c t y o s i p h o n a l e s	
Family: Arthrocladiaceae	
Arthrocladia villosa (HUDSON) DUBY	Ab
Family: Giraudiaceae	
Giraudia sphacelarioides DERBÈS *et* SOLIER	IAtc
Family: Punctariaceae	
Asperococcus bullosus LAMOUROUX	C
A. compressus GRIFFITHS *ex* HOOKER	CB
Family: Myriotrichaceae	
Myriotrichia clavaeformis HARVEY	At
Family: Striariaceae	
Striaria attenuata (GREVILLE) GREVILLE	APtc
Order: S c y t o s i p h o n a l e s	
Family: Scytosiphoniaceae	
Colpomenia sinuosa (MERTENS *ex* ROTH) DERBÈS *et* SOLIER	C
Scytosiphon lomentaria (LYNGBYE) LINK	C
Order: F u c a l e s	
Family: Cystoseiraceae	
Cystoseira adriatica SAUVAGEAU	
var. *adriatica*	M
var. compressa (ERCEGOVIĆ) GIACCONE	M
C. barbata (STACKHOUSE) C.AGARDH	M
C. compressa (ESPER.) GERLOF *et* NIZAMUDDIN	
subsp. *compressa*	Ab
subsp. *rosseta* (ERCEGOVIĆ) ŠPAN *et* ANTOLIĆ	EAD
C. corniculata (VULFEN) ZANARDINI	
subsp. *corniculata*	M
subsp. *laxior* ERCEGOVIĆ	M
C. crinita (DESFONTAINES) BORY	M
C. crinitophylla ERCEGOVIĆ	M
C. schiffneri HAMEL	
f. schiffneri	M
f. latiramosa (ERCEGOVIĆ) GIACCONE	M
C. platyramosa ERCEGOVIĆ	M
C. spicata ERCEGOVIĆ	M

Table 3. cont'd

TAXA	Phyt. elem.
Family: Fucaceae	
Fucus virsoides J.AGARDH	EAD
Family: Sargassaceae	
Sargassum hornschuchii C.AGARDH	M
Sargassum acinarium (LINNAEUS) C.AGARDH	At
S. salicifolium J.AGARDH	M
S. vulgare C.AGARDH	
subsp. *vulgare*	CT
f. *ercegovicii* ŠPAN	EAD
Division: CHLOROPHYTA	
Class: CHLOROPHYCEAE	
Order: V o l v o c a l e s	
Family: Tetrasporaceae	
Palmophyllum crassum (NACCARI) RABENHORST	At
Order: U l o t r i c h a l e s	
Family: Ulotrichaceae	
Ulothrix flacca (DILLWIN) THURET	APtc
U. subflaccida WILLE	APo
Order: U l v a l e s	
Family: Ulvaceae	
Enteromorpha multiramosa BLIDING	M
E. prolifera (MÜLLER) J.AGARDH	APo
Ulva rigida C.AGARDH	C
Family: Chaetophoraceae	
Bolbocoleon piliferum PRINGSHEIM	APtc
Entocladia endolithica (ERCEGOVIĆ) NIELSEN	M
E. viridis Reinke	C
Phaeophila dendroides (CROUAN *et* CROUAN) BATTERS	Abt
Pringsheimiella scutata (REINKE) MARCHEWIANKA	Abt
Ulvella lens CROUAN *et* CROUAN	Abt
Order: C l a d o p h o r a l e s	
Family: Anadyomenaceae	
Anadyomene stellata (WULFEN) C.AGARDH	CT
Family: Chaetosiphonaceae	
Blastophysa polymorpha KJELLMAN	Abt
B. rhizopus REINKE	Abt
Family: Cladophoraceae	
Chaetomorpha aerea (DILLWYN) KÜTZING	C
C. linum (MÜLLER) KÜTZING	C
C. mediterranea (KÜTZING) KÜTZING	Abt
Cladoph coelothrix KÜTZING	IAo
C. dalmatica KÜTZING	Abt

Table 3. cont'd

TAXA	Phyt. elem.
C. echinus (BIASOLETTO) KÜTZING	IP
C. glomerata (LINNAEUS) KÜTZING	APtc
C. lehmanniana (LINDENBERG) KÜTZING	Ab
C. pellucida (HUDSON) KÜTZING	Ab
C. prolifera (ROTH) KÜTZING	Abt
C. sericea (HUDSON) KÜTZING	CB
C. vagabunda (LINNAEUS) HOEK	Abt
Rhizoclonium tortuosum (DILLWYN) KÜTZING	Abt
Family: Siphonocladaceae	
Siphonocladus pusillus (KÜTZING) HAUCK	M
Valonia macrophysa KÜTZING	CT
V. utricularis (ROTH) C.AGARDH	CT
Order: B r y o p s i d a l e s	
Family: Bryopsidaceae	
Bryopsis corymbosa J.AGARDH	M
B. duplex DE NOTARIS	Ab
B. hypnoides LAMOUROUX	C
Family: Codiaceae	
Codium bursa (LINNAEUS) C.AGARDH	Abt
C. effusum (RAFINESQUE) DELLE CHIAJE	IAo
C. vermilara (OLIVI) DELLE CHIAJE	IAtc
Family: Derbesiaceae	
Derbesia tenuissima (MORRIS *et* DE NOTARIS) CROUAN *et* CROUAN - stage	Ab
Halicystis parvula SCHMITZ *ex* MURAY	Ab
Trichosolen myura (J.AGARDH) W.R. TAYLOR	M
Family: Udoteaceae	
Halimeda tuna (ELLIS *et* SOLANDER) LAMOUROUX	CT
Pseudochlorodesmis furcellata (ZANARDINI) BÖRGESEN	APo
P. tenuis ERCEGOVIĆ	EAD
Flabellia petiolata (TURRA) NIZAMUDIN	At
Order: D a s y c l a d a l e s	
Family: Dasycladaceae	
Dasycladus vermicularis (SCOPOLI) KRASSAR	At
Porodica: Polyphisaceae	
Acetabularia acetabulum (LINNAEUS) SILVA	IAt
Division: ANGIOSPERMAE	
Class: MONOCOTYLEDONAE	
Order: P o t a m o g e t o n a l e s	
Family: Potamogetonaceae	
Cymodocea nodosa (UCRIA) ASCHERSON	Ab
Posidonia oceanica (LINNAEUS) DELILE	M